CLAIMS

1. A software controlled electronic dimming ballast, comprising:

an inverter circuit for supplying current to a lamp; and

a dimming control circuit for controlling the current supplied by the inverter circuit to the lamp and thereby causing the lamp to have a desired lamp dimming level, the dimming control circuit including a dimming control signal input for receiving a dimming control signal representative of the desired lamp dimming level, a lamp dimming level feedback signal input for receiving a lamp dimming level feedback signal representative of an existing lamp dimming level, and an inverter control signal output for outputting an inverter control signal having a pulse width and frequency that causes the inverter circuit to supply the lamp with sufficient current to cause the lamp to have the desired lamp dimming level;

the dimming control circuit further including lamp dimming level control software for causing the dimming control circuit to incrementally modulate the pulse width and frequency of the inverter control signal based on the dimming control signal and the lamp dimming level feedback signal.

2. The dimming ballast of claim 1, wherein:

the dimming control circuit converts the dimming control signal into desired dimming level digital data representative of the desired lamp dimming level;

the dimming control circuit converts the lamp dimming level feedback signal into existing lamp dimming level digital data representative of the existing lamp dimming level; and

the lamp dimming level control software causes the dimming control circuit to generate the inverter control signal based on the desired dimming level digital data and the existing lamp dimming level digital data.

3. The dimming ballast of claim 2, wherein:

the lamp dimming level control software causes the dimming control circuit to generate error digital data based on the desired dimming level digital data and the existing lamp dimming level digital data; and

the lamp dimming level control software causes the dimming control circuit to generate the inverter control signal based on the error digital data.

4. The dimming ballast of claim 3, wherein:

the lamp dimming level control software causes the dimming control circuit to use the error digital data to identify inverter control signal digital data; and

the lamp dimming level control software causes the dimming control circuit to generate the inverter control signal based on the inverter control signal digital data.

5. The dimming ballast of claim 1, wherein:

the dimming control signal is an analog dimming control signal;

the dimming control circuit converts the analog dimming control signal into desired lamp dimming level digital data representative of the desired lamp dimming level; and

the lamp dimming level control software causes the dimming control circuit to generate the inverter control signal based on the desired lamp dimming level digital data.

6. The dimming ballast of claim 1, wherein:

the dimming control signal is a digital dimming control signal;

the lamp dimming level control software causes the dimming control circuit to convert the digital dimming control signal into desired lamp dimming level digital data representative of the desired lamp dimming level; and

the lamp dimming level control software causes the dimming control circuit to generate the inverter control signal based on the desired lamp dimming level digital data.

7. The dimming ballast of claim 1, wherein:

the lamp dimming level feedback signal is an analog lamp dimming level feedback signal;

the dimming control circuit converts the analog lamp dimming level feedback signal into existing lamp dimming level digital data representative of the existing lamp dimming level; and

the lamp dimming level control software causes the dimming control circuit to generate the inverter control signal based on the existing lamp dimming level digital data.

8. The dimming ballast of claim 1, wherein:

the inverter control signal is a pulse width modulated inverter control signal; and

the lamp dimming level control software causes the dimming control circuit to generate the pulse width modulated inverter control signal.

9. The dimming ballast of claim 1, wherein:

the inverter control signal is a frequency modulated inverter control signal; and

the lamp dimming level control software causes the dimming control circuit to generate the frequency modulated inverter control signal.

10. The dimming ballast of claim 1, wherein the dimming control circuit further includes:

an input voltage feedback input for receiving an input voltage feedback signal representative of input voltage being supplied to the dimming ballast; and

line voltage control software for causing the dimming control circuit to shut down the inverter circuit if the input voltage feedback signal indicates that the input voltage has fallen below a minimum input voltage level.

11. The dimming ballast of claim 10, wherein the dimming control circuit further includes an input voltage feedback signal conditioning circuit for generating the input voltage feedback signal.

12. The dimming ballast of claim 11, wherein the input voltage feedback signal conditioning circuit includes an input voltage feedback signal resistor connected in parallel with an input voltage feedback signal capacitor.

13. The dimming ballast of claim 1, wherein the dimming control circuit further includes:

a lamp condition feedback input for receiving a lamp condition feedback signal representative of lamp condition; and

lamp condition control software for causing the dimming control circuit to shut down the inverter circuit if the lamp condition feedback signal indicates that the lamp has reached an end of lamp life condition.

14. The dimming ballast of claim 13, wherein the dimming control circuit further includes a lamp condition feedback signal conditioning circuit for generating the lamp condition feedback signal.

15. The dimming ballast of claim 14, wherein the lamp condition feedback signal conditioning circuit includes a lamp condition feedback signal resistor connected in parallel with a lamp condition feedback signal capacitor.

16. A software controlled electronic dimming ballast, comprising:

an inverter circuit for supplying current to a lamp;

a dimming control circuit for controlling the current supplied by the inverter circuit to the lamp and thereby causing the lamp to have a desired lamp dimming level, the dimming control circuit including a dimming control signal input for receiving a dimming control signal representative of the desired lamp dimming level, a lamp dimming level feedback signal input for receiving a lamp dimming level feedback signal representative of an existing lamp dimming level, and an inverter control signal output for outputting an inverter control signal that causes the inverter circuit to supply the lamp with sufficient current to cause the lamp to have the desired lamp dimming level;

the dimming control circuit further including lamp dimming level control software for causing the dimming control circuit to generate the inverter control signal based on the dimming control signal and the lamp dimming level feedback signal; and

the dimming control circuit still further including a lamp dimming level feedback signal conditioning circuit for generating the lamp dimming level feedback signal.

17. The dimming ballast of claim 16, wherein the lamp dimming level feedback signal conditioning circuit includes:

a voltage generating circuit for generating a voltage signal representative of the existing lamp dimming level based on a lamp current signal representative of the existing lamp dimming level; and

wherein the voltage signal is the lamp dimming level feedback signal.

18. The dimming ballast of claim 17, wherein the voltage generating circuit includes a resistor.

19. The dimming ballast of claim 18, wherein the voltage generating circuit further includes a diode connected in parallel with the resistor.

20. The dimming ballast of claim 18, wherein the voltage generating circuit further includes a Zener diode connected in parallel with the resistor.

21. The dimming ballast of claim 17, wherein the voltage generating circuit includes a capacitor.

22. The dimming ballast of claim 21, wherein the voltage generating circuit further includes a diode connected in parallel with the capacitor.

23. The dimming ballast of claim 21, wherein the voltage generating circuit further includes a Zener diode connected in parallel with the capacitor.

24. The dimming ballast of claim 17, wherein the voltage generating circuit includes a capacitor connected in series with a resistor.

25. The dimming ballast of claim 24, wherein the voltage generating circuit further includes a diode connected in parallel with the resistor.

26. The dimming ballast of claim 24, wherein the voltage generating circuit further includes a Zener diode connected in parallel with the resistor.

27. The dimming ballast of claim 17, wherein the voltage generating circuit includes a current transformer.

28. The dimming ballast of claim 16, wherein the lamp dimming level feedback signal conditioning circuit includes:

a voltage generating circuit for generating a voltage signal representative of the existing lamp dimming level based on a lamp current signal representative of the existing lamp dimming level;

an amplifying circuit for generating an amplified voltage signal representative of the existing lamp dimming level by amplifying the voltage signal generated by the voltage generating circuit; and

wherein the amplified voltage signal is the lamp dimming level feedback signal.

29. The dimming ballast of claim 28, wherein:

the amplifying circuit includes an input filter circuit for generating a filtered voltage signal by filtering the voltage signal generated by the voltage generating circuit; and

the amplifying circuit amplifies the filtered voltage signal.

30. The dimming ballast of claim 28, wherein the amplifying circuit includes an operational amplifier for amplifying the filtered voltage signal.

31. The dimming ballast of claim 28, wherein the amplifying circuit includes an amplifier gain circuit for controlling amplifier gain.

32. The dimming ballast of claim 28, wherein the amplifying circuit includes an adjustable amplifier gain circuit for varying amplifier gain based on the dimming control signal.

33. The dimming ballast of claim 16, wherein the lamp dimming level feedback signal conditioning circuit includes:

a voltage generating circuit for generating a voltage signal representative of the existing lamp dimming level based on a lamp current signal representative of the existing lamp dimming level;

an amplifying circuit for generating an amplified voltage signal representative of the existing lamp dimming level by amplifying the voltage signal generated by the voltage generating circuit;

a rectifying circuit for generating a rectified voltage signal representative of the existing lamp dimming level by rectifying the amplified voltage signal generated by the amplifying circuit; and

wherein the rectified voltage signal is the lamp dimming level feedback signal.

34. The dimming ballast of claim 33, wherein the rectifying circuit includes a diode.

35. The dimming ballast of claim 16, wherein the lamp dimming level feedback signal conditioning circuit includes:

a voltage generating circuit for generating a voltage signal representative of the existing lamp dimming level based on a lamp current signal representative of the existing lamp dimming level;

an amplifying circuit for generating an amplified voltage signal representative of the existing lamp dimming level by amplifying the voltage signal generated by the voltage generating circuit;

a rectifying circuit for generating a rectified voltage signal representative of the existing lamp dimming level by rectifying the amplified voltage signal generated by the amplifying circuit;

an output filter circuit for generating a filtered voltage signal representative of the existing lamp dimming level by filtering the rectified voltage signal generating by the rectifying circuit; and

wherein the filtered voltage signal is the lamp dimming level feedback signal.

36. The dimming ballast of claim 35, wherein the output filter circuit includes:

an output filter resistor connected in series with an output filter capacitor; and

a discharge resistor connected in parallel with the output filter resistor and output filter capacitor.

37. A software controlled electronic dimming ballast, comprising:

an inverter circuit for supplying current to a lamp; and

a dimming control circuit for controlling the current supplied by the inverter circuit to the lamp and thereby causing the lamp to have a desired lamp dimming level, the dimming control circuit including a microcontroller integrated circuit (IC) for generating an inverter control signal that causes the inverter circuit to supply the lamp with sufficient current to cause the lamp to have the desired lamp dimming level and a lamp dimming level feedback signal conditioning circuit for generating a lamp dimming level feedback signal representative of an existing lamp dimming level, the microcontroller IC including a dimming control signal input for receiving a dimming control signal representative of the desired lamp dimming level, a lamp dimming level feedback signal input for receiving the lamp dimming level feedback signal, an inverter control signal output for outputting the inverter control signal, and lamp dimming level control software for causing

the microcontroller IC to generate the inverter control signal based on the dimming control signal and the lamp dimming level feedback signal.

38. The dimming ballast of claim 37, wherein:

the microcontroller IC converts the dimming control signal into desired dimming level digital data representative of the desired lamp dimming level;

the microcontroller IC converts the lamp dimming level feedback signal into existing lamp dimming level digital data representative of the existing lamp dimming level; and

the lamp dimming level control software causes the microcontroller IC to generate the inverter control signal based on the desired dimming level digital data and the existing lamp dimming level digital data.

39. The dimming ballast of claim 38, wherein the lamp dimming level feedback signal conditioning circuit includes:

a voltage generating circuit for generating a voltage signal representative of the existing lamp dimming level based on a lamp current signal representative of the existing lamp dimming level;

an amplifying circuit for generating an amplified voltage signal representative of the existing lamp dimming level by amplifying the voltage signal generated by the voltage generating circuit; and

wherein the amplified voltage signal is the lamp dimming level feedback signal.

40. The dimming ballast of claim 39, further comprising:

an alternating current/direct current (AC/DC) converter circuit for converting low frequency AC voltage into DC voltage and for supplying the DC voltage to the inverter circuit; and

wherein the inverter circuit converts the DC voltage into high frequency AC voltage and uses the high frequency AC voltage to supply current to the lamp.

41. The dimming ballast of claim 40, further comprising an electromagnetic interference (EMI) filter circuit for filtering EMI out of the low frequency AC voltage converted by the AC/DC converter circuit.

42. The dimming ballast of claim 39, further comprising:

an alternating current/direct current (AC/DC) converter circuit for converting low frequency AC voltage into DC voltage;

a power factor correction (PFC) circuit for generating a boosted DC voltage by boosting the DC voltage generated by the AC/DC converter circuit, for supplying the boosted DC voltage to the inverter circuit, and for causing power drawn by the dimming ballast to have a desired power factor; and

wherein the inverter circuit converts the boosted DC voltage into high frequency AC voltage and uses the high frequency AC voltage to supply current to the lamp.

43. The dimming ballast of claim 42, further comprising an EMI filter circuit for filtering EMI out of the low frequency AC voltage converted by the AC/DC converter circuit.